REMARKS

This is a submission under 37 C.F.R. § 1.129 (a).

37 C.F.R. § 1.129 (a) states as follows:

> An applicant in an application, other than for reissue or a design patent, that has been pending for at least two years as of June 8, 1995, taking into account any reference made in such application to any earlier filed application under 35 U.S.C. 120, 121 and 365 (c), is entitled to have a first submission entered and considered on the merits after final rejection under the following circumstances: The Office will consider such a submission, if the first submission and the fee set forth in § 1.17 (r) are filed prior to the filing of an appeal brief and prior to abandonment of the application. The finality of the final rejection is automatically withdrawn upon the timely filing of the submission and payment of the fee set forth in § 1.17 (r). If a subsequent final rejection is made in the application, applicant is entitled to have a second submission entered and considered on the merits after the subsequent final rejection under the following circumstances: The Office will consider such a submission if the second submission and a second fee set forth in § 1.17 (r) are filed prior to the filing of an appeal brief and prior to abandonment of the application. The finality of the subsequent final rejection is automatically withdrawn upon the timely filing of the submission and payment of second fee set forth in §1.17 (r)...

It is to be noted that the present application was filed on June 7, 1995 and is a continuation of U.S.S.N. 07/580,246 filed on September 10, 1990.

This submission under 37 C.F.R. § 1.129 is proper. This application has been pending for at least two years, as of June 8, 1995, taking into account the reference made in such application to any earlier filed application.

Moreover, in accordance with the provisions of 37 C.F.R. §1.129 (a), applicants are entitled to have a second submission entered and considered as long as the application has not been abandoned, no Appeal Brief has been filed and a second Final Action has been issued. The last Office Action issued from the USPTO was a Final Action. Moreover, the present application is not abandoned and no Appeal Brief has been filed in connection with the above-identified application. Inasmuch as the submission is accompanied by the fee required in 37

C.F.R. § 1.17 (r) the submission under 37 C.F.R. § 1.129 (a) is proper. Pursuant to the provisions of 37 C.F.R. § 1.129 (a), withdrawal of the finality of the last office action and entry of the submission are respectfully requested.

This submission is being filed to add additional claims to the application and to address the issues based on the Final Action.

Applicants have added Claims 108-122 to the present application. The subject matter therein is adequately supported in the application. Support can be found in the instant application. For example, the application provides ample support for fullerenes recited in Claims 121 and 122 and for the term a carbon alleotrope consisting solely of carbon atoms, which is soluble in organic solvent in the Claims 108-120. Support thereof permeates the specification. More specifically, the specification describes three species C_{60}, C_{70} and C_{240}. Each of these molecules is a fullerene. C_{60} is fullerene-60, C_{70} is fullerene-70 and C_{240} is fullerene-240. The application refers to "new form of carbon", (Page 1, Line 6), which defines a form of carbon other than diamond or graphite. It also describes an allotrope of carbon (e.g., see original Claim 27, and Page 16, Line 26 of the instant application), compounds made solely of carbon atoms soluble in non-polar organic solvents (see, e.g., Page 11, Lines 8-11 of the instant specification) and they form a carbon cage (see, for example, Page 11, Lines 9 and 20 in the instant specification). All of these are descriptions and characterizations of and are synonymous with fullerenes. The whole thrust of the application is directed to a new form of carbon. In fact, the application is so titled. All of these delineations are different descriptions of and connote only one subject matter to one of ordinary skill in the art, viz., fullerenes. Further as shown hereinabove, the language in the specification supports "a cage carbon alleotrope consisting solely of carbon atoms soluble in non-polar organic solvents", as recited in the added claims.

Case law has held that compliance with the description requirement of 35 U.S.C. §112, first paragraph, requires the specification to reasonably convey to the skilled artisan that the inventor had possession at the time of the filing of the application of the claimed subject matter. Fiers v. Revel, 984 F.2d 1164, 25 USPQ 2d 1601 (Fed. Cir. 1993). As evidence thereof that a skilled artisan so understands, applicants refer to a Declaration of Harold W. Kroto, a renowned expert in the field of fullerenes, that was submitted in copending application USSN 08/236,933 and executed on June 9, 1995 (hereinafter "Kroto Declaration I"). Attention is directed to Paragraph 15 of Kroto Declaration I wherein he states:

> In my professional judgment, the above identified application adequately teaches to the skilled artisan how to make macroscopic amounts of fullerene including C_{60} and C_{70}; furthermore, there is ample evidence in the application that Huffman and Kratschmer had in their possession macroscopic amounts of these products.

Thus, Kroto, who is a skilled artisan in the field, understood when he read the specification that the inventors had in their possession fullerenes at the time of the filing of the application.

Even the Office Action dated June 3, 1996 characterizes the product of the invention as fullerenes. Attention is directed to Page 6 of the Office Action, wherein the products of the specification are defined in terms of fullerenes:

> To illustrate, the literal language of the original disclosure supports the production of fullerenes in quantities sufficient to produce coatings that are 2 microns thick. (Emphasis added).

The Office Action defines the products produced in the specification as fullerenes, indicating that even the United States Patent and Trademark Office agrees that the applicants had

"fullerenes" in their possession at the time of the filing of the application and that the application has ample support under 35 U.S.C. §112, first paragraph, for said term.

Moreover, the fullerenes produced were visible. Support thereof is found throughout the specification. For example, attention is directed to Example 1 of the instant specification, wherein it is specified that the C_{60} product produced therefrom is obtained as a powder and wherein the color of the product produced therefrom is indicated. Obviously, the isolation of a product as a powder connotes that the product could be seen with the naked eye, i.e., it is visible. In addition, attention is directed to Page 11, line 30 of the specification, wherein it is indicated that the IR is taken of an approximately two micrometer thick C_{60}- fullerene coating on a silicon substrate. Especially since C_{60}-fullerene is colored, it is obvious that this coating can only be discernible if the material is visible.

Moreover, there is ample support for the fullerenes being a solid. See Page 6, lines 20-22, Page 8, line 6, to Page 11, line 14 and Example 1 wherein it is noted that the product is a powder and can be crystallized. These characteristics denote a solid.

Keeping the above in mind, tabulated hereinbelow is the support for the added Claims:

# Claim	Support
108	Page 3, Line 26 to page 7, Line 15
109	Page 7, Lines 12-13
110	Page 3, Line 26 to page 7, Line 15
111	Page 3, Line 26 to page 7, Line 24
112	Page 3, Line 26 to Page 7, Line 24
113	Page 3, Line 26 to Page 7, Line 24

114	Page 3, Line 26 to Page 7, Line 24
115	Page 3, Line 26
116	Example 1, page 16, Lines 10-15
117	Example 1, page 16, Lines 10-15
118	Page 3, Line 26 to Page 7, Line 24
119	Page 3, Line 26 to Page 7, Line 24
120	Page 7, Lines 18-25, Example 1
121	Page 7, Line 18-25, Example 1

Thus, no new matter has been added to the application.

As indicated herein, this submission is being filed to address the issues raised in the Final Action dated June 3, 2005 wherein Claims 89, 93 and 107 are rejected under 35 U.S.C. §112, first paragraph, as allegedly containing subject matter which is not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that applicants were in possession of the claimed invention at the time the application was filed. Claims 90-92 and 95-106 were rejected under 35 U.S.C.§102(b) or, in the alternative under 35 U.S.C. §103(a) as defining subject matter which is allegedly anticipated by, or in the alternative rendered obvious by, the teachings in the article by Kroto, et al. in Nature 1985, 318, 162-163 ("Kroto, et al.") in view of an article by Curl, et al., in Scientific American, 1991, 54 ("Curl, et al.").

It is respectfully submitted that the comments hereinbelow are deemed to place the present case in condition for allowance. Favorable action is respectfully requested.

In support of the rejection of Claims 89, 93 and 107, under 35 U.S.C. § 112 first paragraph, the Office Action alleges that there is inadequate support for the term "macroscopic".

Contrary to the allegations in the Office Action, the term "macroscopic", as used in the rejected claims, is fully supported by the underlying specification. Contrary to the allegations in the Final Rejection, in this context, there is adequate support, in accordance with the written description requirement of 35 U.S.C. §112, first paragraph, for the term "macroscopic amount" as it relates to the subject matter herein.

The written description requirement of 35 U.S.C. §112, first paragraph, provides that:

> [t]he specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise and exact terms so as to enable any person skilled in the art to which it pertains or with which it is most nearly connected to make and use the same... (Emphasis added).

The written description requirement, which is distinct from the enablement and best mode requirements, serves to ensure that applicants have possession of the invention at the time of the filing of the application. In re Wertheim, 541 F.2d 257, 262, 191 USPQ 90, 96 (CCPA 1976). In order to meet the written description requirement, the applicant does not have to use any particular form of disclosure to describe the subject matter, but the "description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed." In re Gosteli, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989). In other words, the applicants must convey with reasonable clarity to the skilled artisan that as of the filing date he or she was in possession of the invention. Vas Cath., Inc. v. Mahurkar, 935 F.2d 1555, 1563-64, 19 USPQ 2d 1111, 1117 (Fed. Cir. 1991). Literal support is thus not necessary for compliance with the description requirement. Id.

There is adequate support in the application for the term "macroscopic" in the application. More specifically, support for this term and concept permeate the specification.

The application reasonably conveyed to one of ordinary skill in the art that the inventors had possession, at the time of the filing of the instant application, of macroscopic amount of fullerenes, as evidenced by reviewing the instant application.

For example, a review of the application on Page 1 and Page 2 clearly shows that the application was comparing the amounts of fullerenes, e.g., C_{60} and C_{70}, prepared by the instant process to that which was prepared in the closest prior art reference, a paper by Kroto, et al. in Nature 1985, 318, 162 (hereinafter referred to as the "Nature 1985 article"), of record. This article describes the experiment in which a solid disk of graphite was vaporized into a high density helium flow using a focused pulsed laser. The resulting vaporized carbon was expanded in a supersonic molecule beam and photoionized using an excimer laser, thereby forming molecular ions. The molecular ions, and not the molecules themselves, were detected by time of flight mass spectroscopy. Based on the results, Kroto, et al. speculated that they identified C_{60} and/or C_{70}; however, so little was obtained that Kroto, et al. could not perform any tests to verify the same. In fact, years later Curl and Smalley (two of the authors of the aforesaid Nature 1985 article), in Scientific American 1991, 54-63, of record (hereinafter "Curl, et al."), reflected upon the events leading to the isolation of macroscopic amounts of fullerenes, and commented that Kroto, et al. only collected minute amounts of material, which provided indirect evidence of the existence of fullerenes and which was not enough to see, smell, touch, etc.

> Although our evidence was sound and our conclusions were supported by extensive further experiments and theoretical calculations, we could not collect more than a few tens of thousands of these special new molecules. This amount was plenty to detect and probe with the sophisticated techniques available in our laboratory, but there was not enough to see, touch or smell. Our evidence was indirect, much as it is for physicists who study antimatter. For now, the fullerenes existed only as

> fleeting signals detected in our exotic machines. But as chemists, we knew that the new material ought to be perfectly stable. Unlike antimatter, the geodesic forms of carbon should be quite safe to hold in one's bare hand. All we had to do was make more of them-billions and billions more.

Id. at 54.

The instant application describes that the publication in the Nature 1985 article only postulated the existence of C_{60}, as it indicates, on Page 1, lines 14-31 of the instant specification:

> ... all that was observed was a peak in the mass spectra of said carbon vapor. However, Kroto, et al. did not isolate any of said compound... Yet, to date, no one has been successful in verifying the existence of this molecule since no one has been successful in isolating the molecule in measurable amounts. Thus, no process for producing recoverable amounts of this new compound has been described at the present time. (Emphasis added)

Id.

On Page 2, lines 7-14, the instant specification describes C_{70} and it states at lines 10-13 thereof:

> ...Like the (C_{60}) to date, no one has been successful in verifying the existence of C_{70}. Heretofore, no one has been successful in obtaining the molecule in any appreciable amounts. (Emphasis added)

Id, pg. 2, lines 6-14.

In the SUMMARY OF THE INVENTION the present application further states:

> A process has now been developed for the production of recoverable amounts of C_{60} and C_{70}.... The process of the present invention produces C_{60} and C_{70} in recoverable amounts and permits realization of the proposed uses described hereinabove. (Emphasis added)

Page 2, lines 16 to 34 of the instant specification.

These proposed uses were the uses proposed in the publication by Kroto, et al. in the Nature 1985 article, in which the authors state the following:

> ...If a large scale synthetic route to the C_{60} species can be found, the chemical and practical value of the substance may prove extremely high. One can readily conceive of C_{60} derivatives of many kinds, such as C_{60} transition metal compounds, be a super lubricant... If stable in macroscopic, condensed phases, this C_{60} species would provide a topologically novel aromatic nucleus for new branches of organic and inorganic chemistry. Finally, this especially stable and symmetrical carbon structure provides a possible catalyst and/or intermediate to be considered in modelling prebiotic chemistry... (Emphasis added)

Nature 1985, p. 14.

A review of Page 2 of the instant specification indicates that these were among the utilities listed in the present application for the new form of carbon, fullerene.

Taken together, these passages clearly connote to one of ordinary skill in the art that the present inventors have found a means of producing fullerenes in amounts that have not been realized heretofore. The amounts referenced to were significantly larger than that produced by Kroto, et al. in the Nature 1985 article. By referring to the utilities listed in the Nature 1985 article, and stating that the invention produces sufficient C_{60} and C_{70} which are examples of fullerenes to permit the realization of these utilities, which can only be achieved, as indicated by Kroto, et al., if a large scale synthetic route for C_{60} can be found, such as if present in macroscopic amounts, it is evident that the amounts referred to in the application through the use of such terms as "appreciable amounts", "measurable amounts" and "recoverable amounts" connote amounts present sufficient to be seen. In fact, "appreciable" by definition, means "enough to be perceived." See Webster Unbridged Dictionary 2nd Ed. p.91 (1983). Appreciable, when given its broad definition, is consistent with the term "macroscopic". Moreover,

"recoverable amounts," and "measurable amounts" when put into this context, also connote large scale amounts, e.g., macroscopic amounts. Thus, put into proper context, the passage on Pages 1 and 2 of the instant specification reasonably conveys to the skilled artisan that the Appellants had produced fullerenes in macroscopic amounts.

Moreover, the instant application contains additional evidence that the fullerenes were produced in macroscopic amounts. As the instant application describes on Page 6, lines 11 to Page 7, line 12, when the sooty carbon product, prepared by the vaporization of graphite in accordance with the procedure described therein was placed in benzene, it turned brownish-red. Further, attention is directed to Example 1 on Page 16 of the instant specification, wherein it specifically exemplifies the preparation of the sooty carbon product in accordance with the present invention and the extraction thereof with benzene to produce a wine-red to brown color. The fact that the benzene solution was colored is significant. Appellants indicated that this indicated to one of ordinary skill in the art that macroscopic amounts of fullerenes were present therein. This amount is to connote macroscopic amounts to one of ordinary skill in the art. As evidence thereof, reference is again directed to Curl, et al., which described that since the publication of the 1985 Nature article, scientists from all over the world were trying to make fullerenes, in macroscopic amounts. As stated therein:

> Thus, for five years, we had been searching for a method of producing visible amounts of the stuff. We called our efforts "the search for the yellow vial" because quantum calculations for such a soccerball-shaped carbon molecule suggested it would absorb light strongly only in the far violet part of the spectrum...
> In our laboratory we collected the sooty carbon produced by the vaporization laser while using various chemical techniques to detect the presence of C_{60}. We slurried the soot in benzene, for example, and looked for a yellow color. But the

> solution in our test tubes stayed clear, with boring black soot sitting on the bottom.
> ...When the Krastchmer-Huffman group finally added benzene to their camel sample and saw the color red develop, they realized they were looking at the first concentrated solution of fullerenes ever seen. They evaporated the solvent and found that tiny crystals remained, which readily redissolved. The crystals could be sublimed under a vacuum near 400 degrees Celsius and condensed on a cold microscope slide to form smooth films of solid materials, which Kratschmer and Huffman christened "fullerite"...
> In thin layers, these films were yellow (a fact that those of us at Rice University who searched for a yellow vial found highly gratifying). (Emphasis added)

Id, at Pages 55 and 57.

Thus, a competitor of the present inventors had correlated the colored solution of benzene containing the fullerenes, e.g., the C_{60} product, with "visible amounts", i.e., macroscopic amounts of same. As one reads the article, it is quite apparent that the whole thrust of the article was to describe the procurement of visible amounts, i.e., macroscopic amounts, of fullerenes, e.g., C_{60} and C_{70}. They acknowledged that Huffmann and Kratschmer were they first to achieve this feat by repeating the process, which is exemplified in the Nature article, published in 1990 by Huffmann and Kratschmer and the details of this process are also described in the present application. Thus, they admit that Huffmann and Kratschmer were the first to isolate macroscopic amounts of same. They state, for example, that Huffmann and Kratschmer

> "... were the first to observe the roundest of all round molecules..."

Id. Page 54-57.

They "were looking at the first concentrated bottom of fullerenes ever seen."

Thus, they admit that the Huffmann-Kratschmer process produced macroscopic amounts of fullerenes.

Moreover, inasmuch as the benzene solution was colored, it meant to one of ordinary skill in the art that macroscopic amounts of fullerenes were present in the colored benzene solution described in the instant application.

Moreover, if one repeated the teachings described in the instant application, as testified by both Dr Kroto, a Nobel Prize laureate and Dr. Loufty in their respective Declarations, infra, one would find that macroscopic amounts of fullerene, were present in the benzene solution obtained in accordance with the process described in the instant application. The present inventors accomplished what Kroto et al could not accomplish at the time of filing the application, and that is the production of fullerenes, is macroscopic amount. The fact that Curl et al were unable to make macroscopic amounts supports the inventiveness and patentability of the present invention.

Additional evidence that the instant application readily conveys to one of ordinary skill in the art that the Appellants were in possession of macroscopic amounts of fullerenes, is found on Page 4 thereof:

> ...In the production of C_{60} and C_{70}, any procedure for vaporizing carbon can be used, although the preferred method relies on the use of a high intensity electrical current with graphite rods as electrodes. These rods are constructed to permit vaporization of carbon at the tip of the rod to produce a high density vapor of carbon.

The high density of carbon vapor produced by the vaporization of graphite facilitated the formation of fullerenes, in macroscopic amounts. As evidence thereof, attention is directed to the Loutfy Declaration of record, Paragraph 15:

> ...Even though it appears simple to the uninformed, especially in hindsight, the process of Dr. Kratschmer and Huffman as described in the subject application, is a remarkable discovery, which produced a high density of vapor of carbon as described on Page 4 of the subject application which resulted in the formation of macroscopic amounts of fullerenes by their method. From 1985, when Dr. Smalley, et al. at Rice University discovered the existence of C_{60} and C_{70} atoms by spectrographic analysis of a vapor... until Dr. Huffman, et al. published their discovery in 1990 no one else realized how to produce and recover macroscopic quantities of these fullerenes, despite the availability of equipment that could have been used for this purpose.

Paragraph 15 of Loutfy Declaration:

The formation of the high density of carbon vapor was lacking in the previous methods reported in the literature. One of ordinary skill reading the specification at the time of the filing of the application understood that by forming a high density of carbon vapor, the Appellants were able to produce macroscopic amounts of fullerenes, by their method. Thus, this passage is further evidence that the application as originally filed reasonably conveyed to one of ordinary skill in the art that the inventors had possession of a process for making macroscopic amounts of fullerenes.

There are other indices in the instant application that evidence to one of ordinary skill in the art that the instant application describes the process of making macroscopic amounts of fullerenes.

For example, the instant application on Page 7, lines 24-25, describes that the product produced by sublimation of the carbon soot is obtained as a brown to gray coating and the color is brown to gray, depending on the thickness of the coating. In other words, the color differentiated between the amounts of fullerene that was present on the sublimation collecting

surface. This fact is also consistent with macroscopic amounts of fullerene product being formed. One of ordinary skill in the art can observe differences in color with the naked eye and utilize this difference in color to determine relative amounts of fullerene product formed. One need not resort to the use of a microscope, or other instruments to determine the presence of fullerene by the process described in the instant application.

In addition, the application describes on Page 7, lines 19-22 that the product obtained from extraction is a dark brown to black crystalline material. The fact that the one sees colors and utilizes the color to differentiate between the different products indicates to one of ordinary skill in the art that the product was produced in amounts that can be seen with the human eye, as color is something that the human eye can perceive and differentiate.

In addition, attention is directed to Example 1 of the instant specification wherein it is specified that a C_{60} product, which is an example of fullerene is obtained as a powder and wherein the color of the product produced therefrom is indicated. Obviously, the isolation of a product as a powder taken together with the fact that it is a colored powder connotes that the product could be seen with the naked eye, consistent with the use of the term "macroscopic amounts", as recited in the claims. As shown hereinbelow, Dr. Kroto testifies that this fact evidences that the instant application reasonably conveys to one of ordinary skill in the art that the inventors had possession of a process of making macroscopic amounts of fullerenes. See Kroto Declaration, dated Nov. 16, 1999, Paragraph 15.

As further evidence that the instant application reasonably conveys to one of ordinary skill in the art that the inventors had possession of macroscopic amounts of fullerenes at the time of filing, of the application, attention is directed to the Declaration of Dr. Kroto, a Nobel Prize laureate, of record. Dr. Kroto testified that the instant application reasonably conveyed to one of

ordinary skill in the art that the inventors were in possession of macroscopic amounts of fullerenes at the time of filing the application. See, for example, Paragraph 3 of the Declaration of Kroto dated July 27, 1995 wherein he attests that "[s]pecifically, the application described the production of C_{60} and C_{70} in macroscopic amounts, i.e., amounts that could be seen with the naked eye." See also Paragraph 3 of the Declaration of Kroto dated June 9, 1995. Attention is further directed to the Kroto Declaration dated June 9, 1995, at Paragraphs 14 and 15, in which he attests that the application adequately describes the method for making macroscopic amounts of fullerenes and that based upon the teachings in the application, it is his opinion that the inventors had in their possession at the time of the filing of the application macroscopic amounts of same. Furthermore, Dr. Kroto refers to the fact that the colored powder formed in Example 1 connotes macroscopic amounts of fullerenes as discussed hereinabove. More specifically, attention is directed to Paragraph 15 of Dr. Kroto's Declaration dated November 16, 1999, wherein he states:

> Moreover, the specification provides evidence in several instances that the inventors had produced the fullerene products, including C_{60}, in macroscopic amounts. For example, attention is directed to Example 1, which describes the product thereof in powder form as brownish-red. Such language connotes, in my opinion, that the product thereof could be seen with the naked eye. Moreover, based upon repetition of the process described therein, as described hereinbelow, the process as described in the above-identified application, especially in Example 1, inherently produces fullerenes, e.g., C_{60}, in amounts that could be seen with the naked eye...

As further evidence, Kroto testified in the Kroto Declaration dated November 16, 1999, in Paragraph 15 that by following the procedure described in the above-identified application, he

had invariably produced fullerenes in macroscopic amounts. As Kroto testifies in Paragraph 15 of the Declaration:

> ...Moreover, based upon repetition of the process described therein, as described hereinbelow, the process as described in the above-identified application, especially in Example 1, inherently produces fullerenes, e.g., C_{60}, in amounts that could be seen with the naked eye.

Dr. Kroto further testifies in Paragraphs 17, 18 and 19 of the Declaration dated November 16, 1999, as follows:

> 17. Utilizing the procedure exactly as described in the above-identified application, I have had fullerenes, including C_{60}, prepared in macroscopic amounts on numerous occasions since 1990 to the present. More specifically, by following the procedure described in the above-identified application and vaporizing graphite rods in an atmosphere of helium, forming the carbon soot therefrom, collecting the soot and dissolving the soot in benzene, in accordance with the procedure described in the above-identified application, I and my colleagues have prepared and identified various fullerenes, including, inter alia, C_{60}, C_{70}, C_{76}, C_{78}, C_{84} and C_{86}.
>
> 18. Moreover, by following the procedure described in the above-identified application, and in accordance with the procedure outlined in Paragraph 17 herein, we have isolated fullerenes in macroscopic amounts, as defined herein. For example, utilizing the procedure outlined in Paragraph 17, I have found that the smoky carbon product contains 5 to 10% C_{60} and 1% C_{70}. We routinely produce the soot in 1-5 gram quantities and routinely extract 100-500 milligram amounts batchwise. Thus, one kilogram of sooty carbon product produces, on average, 100g of C_{60}, 10g of C_{70} and 1 gram of other fullerenes, such as those indicated hereinabove. The various fullerenes formed can and are isolated in accordance with the isolation and purification procedures described in the above-identified application, without an undue amount of experimentation. Furthermore, the various fullerenes are isolated as solids, which are easily visible to the naked eye. For example, in a typical experiment conducted according to the procedure

> described in the above-identified application, C_{60} is formed in about 100 mg quantities, C_{70} in about 10 mg quantities and the remainder in about 1 mg quantities.
>
> 19. Thus, by following the procedure described in the above-identified application, I have found that the process described therein inherently produces ... C_{60}, in macroscopic amounts. In fact, by following the procedure of Kratschmer and Huffman, outlined in the above identified application, crystalline material of fullerenes, including C_{60}, is produced which can be seen with the naked eye. (Emphasis added.)

Thus, by following the procedure described in the application, Dr. Kroto testified that he obtained macroscopic amounts of fullerene.

As further evidence thereof, attention is directed to the Declaration of Raouf Loutfy, another expert (hereinafter "Loutfy Declaration"). In his Declaration, Dr. Loutfy testified that by following the teachings in the instant application, macroscopic amounts of fullerenes were provided:

> 11. Although the subject patent application of Dr. Kratschmer and Huffman does not expressly use the term "macroscopic amounts" to describe the amounts of fullerenes, e.g., C_{60} and C_{70} first isolated by them, in accordance with the teaching of the process described therein, the fullerenes, e.g., C_{60} and C_{70}, that were prepared in accordance with the process described herein, were produced in measurable amounts that were visible to them, and it is my professional opinion that these amounts are inherently amounts definable by the term "macroscopic amounts".

Paragraph 11 of the Loutfy Declaration.

As testified by Dr. Loutfy, he repeated exactly the procedure described in the underlying application utilizing graphite rods of one quarter inches in diameter, as described in the instant

specification, as for example, on Page 6, line 32 to Page 7, line 1 of the instant specification. Dr. Loutfy testified that he vaporized the graphite, in accordance with the teachings in the application. By following the procedure described therein, he produced macroscopic amounts of fullerenes (See Paragraph 17 of Loutfy Declaration):

> 17. I repeated exactly the Huffman et al. process according to the teaching described in the subject application including example 1 using ¼ inch in diameter graphite rod, at 100 torr Helium, using 100 ampere dc current. This graphite vaporized, and the vapor was condensed on a water cooled surface. The vaporization was performed for 50 minutes using about 17 cm length of the graphite rod and produced 12 gram of soot. The fullerenes were recovered using toluene and the amount of fullerene was determined. The yield of fullerene was about 8 to 10%. Accordingly, the total recoverable fullerenes was over 1.2 grams with over 900 mg of C_{60} and over 200 mg of C_{70} and the remaining other fullerenes...(Emphasis added)

Loutfy Declaration, Paragraph 17

Based upon the teachings in the instant application, Dr. Loutfy calculated the amount of C_{60} and C_{70} examples of fullerenes produced by the inventors in Example 1, and concluded that the amount produced was, without question in macroscopic amounts. See Paragraphs 17 and 18 of Loutfy Declaration:

> ...According to the teaching in the subject application where they vaporized a ¼" graphite rod with 1 cm length, the inventor must have produced at least about 600 mg of soot that contains admixture of at least 63 mg of fullerenes that contain at least about 50 mg of C_{60} and at least about 10 mg of C_{70}. A 600 mg quantity of soot certainly can be seen by the naked eye, as also indicated by the inventor that "heavy block coating on collecting substrates and/or on the walls of the chamber which can be easily scraped off for the recovery step." Also, the 60 mg of fullerene

> certainly can be seen by the naked eye and it is measurable. Furthermore, the 45 and 10 mg of C_{60} and C_{70} respectively are also measurable, in today modern laboratory facility amount as low as 0.1 mg can be measured, and can be seen by the naked eye.
>
> The same conclusion can be reached by simply calculating the mass of the rod vaporized in Kratschmer et al. subject application, including example 1, which is easily determined from the diameter of the graphite rod they used (1/4"), the length (1 cm), and typical density of the type of graphite used for graphite vaporization (2.0 g/cc). This calculation estimates that about 633 mg of soot containing fullerenes was produced by Kratschmer et al., which is certainly macroscopic and in agreement with the above-presented experimental data.
>
> Moreover, if a longer graphite rod were used, the amount of C_{60}, C_{70} and other fullerenes produced would even be greater, as shown herein above. (Emphasis added).

Loutfy Declaration, Paragraph 17.

Thus, as indicated by Dr. Loutfy, macroscopic amounts of fullerenes, e.g., C_{60} were produced in Example 1 of the instant application. As further testified by Dr. Loutfy in Paragraph 18:

> It is my opinion that the inventors of this subject application were the first to isolate and recover a measurable or macroscopic amount of fullerenes, and to teach others to do so. Their description in the application is clearly understood by ordinary skilled artisans, and when repeated by us allowed us to produce visible, measurable commercial quantities of fullerene product, commonly described as "macroscopic quantities".

Loutfy Declaration, Paragraph 18.

Thus, Dr. Loutfy testifies that the process of the present invention inherently produces fullerenes in macroscopic amounts (See Paragraph 11 of Loutfy Declaration). Dr. Loutfy further testifies that when he performed an experiment based upon the teachings in the underlying

application, including Example 1, in which a graphite rod ¼ inch in diameter and 17 cm long, was vaporized at 100 torr Helium using 100 ampere dc current for about 50 minutes, he produced 12 grams of soot. He extracted the soot with toluene and the yield of fullerene was about 8 to 10%. Thus, he recovered over 1.2 grams of fullerene, with over 900 mg of C_{60} and over 200 mg of C_{70}. See paragraph 17 of Loutfy Declaration. Since amounts as low as 0.1 mg can be seen with the naked eye, this amount of fullerenes can be seen with the naked eye. Id.

Dr. Loutfy further testified that if he utilized a shorter length of graphite such as 1 cm length, as discussed in the underlying application including Example 1, he still produced macroscopic amounts of fullerene including 50 mg of C_{60} and 10 mg of C_{70}, which is still greater than the lower limit of 0.1 mg seen with the naked eye. Furthermore, if one calculates the amount of soot that would be produced from a 1 cm length and ¼ inch diameter graphite rod, the calculation would estimate that 633 mg of soot would be produced. Id. If one assumes 10% yield, then approximately about 66 mg of C_{60} and about 53 mg of C_{70} would be produced, which amounts are well above the amount that could be seen with the naked eye. Further, if a longer graphite rod were used, the amount of C_{60} and C_{70} produced would be even greater. Again, this provides ample evidence that fullerenes produced in accordance with the present process is in macroscopic amounts.

Attention is further directed to U.S. Patent No. 6,077,401, attached to the Loutfy Declaration which indicates in Column 2, lines 11-38 thereof that rods with ¼ inch diameter are capable of producing yields of around 15%. Consequently, since the amounts testified by Dr. Loutfy in the Loutfy Declaration assumed yields of 8-10%, this means that the amount of C_{60} and C_{70} produced in the experiment conducted by Dr. Loutfy can be even higher, further

supporting appellants' position that the underlying application provides an adequate description of fullerenes in macroscopic amounts.

Thus, there is no question that the underling application produces fullerenes in macroscopic amounts.

Thus, the data provided in Dr. Loutfy's Declaration further supports that the inventors at the time of the filing of the instant application were in possession of macroscopic amounts of fullerenes.

Further, it is noted the term Macroscopic is used in the normal everyday sense, i.e., in amounts that could be seen. Thus, the fact that scientists following the procedures described in the instant application and obtain products comprising fullerenes, e.g. C_{60} and C_{70}, in macroscopic amounts, is evidence that the present application conveys to one of ordinary skill in the art that the inventors, at the time of filing the underlying application, were in possession of macroscopic amounts of fullerene.

In fact the scientific community has recognized that the process of Huffman and Kratschmer, et al., which is exemplified in the article by Kratschmer, et al., Nature, 1990, 354, produces fullerenes, e.g., C_{60} or C_{70} in macroscopic amounts. Attention is directed to Column 1, lines 58-61 of U.S. Patent No. 6,077, 401, which is attached as Exhibit 2 to the Loutfy Declaration. The '401 patent indicates that Huffman and Kratschmer were the first to isolate macroscopic amounts of C_{60}. In addition, attention is directed to the article by Curl and Smalley in which they admit that Huffman and Kratschmer were the first to isolate fullerenes, e.g., C_{60} and C_{70}, in macroscopic amounts. The process described in the Nature article is the same as the process described in the application.

It is to be noted that Huffman and Kratschmer, along with Smalley and Kroto, were given the 1994 Hewlett Packerd Europphysics Prize by the European Physical Society for their discovery of fullerenes. In addition, only Huffman and Kratschmer and not Smalley, et al. were awarded the 1993 Materials Research Society Award for Synthesis and Pioneering Study of Fullerenes. These awards and the accompanying information show that Huffman and Kratschmer discovered fullerenes. Furthermore, the Swedish Academy in their press release awarding the Nobel Prize to Kroto, and Smalley, et al., acknowledged the contributions of Huffman and Kratschmer for being the first to make macroscopic amounts of fullerenes. The process, which they used to isolate the C_{60}, C_{70} and other fullerenes in macroscopic amounts is the process, which is described in the underlying application and exemplified in the Nature article.

Accordingly, one can reach only one conclusion with respect to the issue of the written description for the term "macroscopic amounts of fullerenes"; that is, there is adequate support, in compliance with the description requirement of 35 U.S.C. §112, first paragraph for the term "macroscopic" amounts of fullerenes.

Thus, contrary to the allegations in the Final Rejection, there is adequate support in the application for the term "macroscopic" amounts with respect to fullerenes. Thus, for the reasons provided herein, the rejection of Claims 89, 93 and 107 under 35 U.S.C. §112, first paragraph is obviated. Withdrawal thereof is respectfully requested.

Pursuant to the rejection of Claims 90-92 and 95-106 under 35 U.S.C. §102(b), or in the alternative under 35 U.S.C. §103 the Office Action cites Kroto, et al. with Curl, et al. cited to show a state of fact.

Claims 90 and 91 recites that the fullerene is a visible product, while Claim 92 recites that the fullerene is a visible solid. As one skilled in the art is well aware, if the fullerene produced is visible, then it can be seen with the naked eye. As defined in Webster's Dictionary, visible implies that is capable of being seen with the naked eye. Claims 95 and 96 are dependent upon the aforementioned claims and thus the above comments are incorporated by reference. Claim 97 recites that the cage carbon alleotrope, i.e., fullerene, is isolated as a visible product. Claims 98 and 99 and claims dependent thereon (Claims 100-103) are directed to fullerenes as visible solid. It is to be noted that the process that is described in Claims 98 and 99 is the formation of a product that is predominately a fullerene and not a product comprised of fullerene. Thus, Claim 98 and 99 and claims dependent thereon are directed to fullerene products comprised substantially of fullerenes visible to the eye. Claims 104-106 are directed to amounts of fullerenes.

Thus, in all cases, the fullerenes is produced in amounts that would be seen, i.e., macroscopic amounts.

Kroto, et al. is directed to a method of making C_{60}, C_{70} in which graphite was vaporized by laser irradiation and detected by time of flight mass spectroscopy. As stated in Curl, et al. at page 54, Kroto, et al. could not collect more than a few tens of thousands of molecules. As stated:

> "This amount was plenty to detect and probe with the sophisticated techniques available in our laboratory, but there was not enough to see, touch or smell."

Thus, it is admitted that by the techniques described in Kroto et al., only a few thousands of molecules were made, but it was not sufficient to see as a visible product. However, as

claimed herein, the amount of fullerenes recited in the claims is that amount which is visible. Moreover, since any fullerenes produced by Kroto et al. in the aforesaid Nature article could not be seen, fullerenes could not be isolated as a solid product. However, as claimed herein, the fullerenes are isolated as a solid. Thus, contrary to the claims of the present application the fullerenes produced by Kroto et al. were not made in the amounts as claimed by the present application.

On the other hand, the claims in the present application recite that the fullerenes are visible. See definition of "macroscopic" in Webster's Dictionary. In addition, the claims recite that the product is produced in sufficient amounts to be isolated as a visible solid. Again, this amount can only be achieved if the product were visible. Kroto, et al. do not teach, disclose or suggest fullerenes in these amounts. This fact is admitted by authors of these article in Scientific American, 1991 pp 54-63. Attention is directed to pg. 54-55, in which they admit that they never produced visible or macroscopic amounts of fullerenes.

Since the Kroto, et al. reference does not teach all of the elements of the claims, e.g., that the fullerenes are present in visible amounts, Kroto, et al. do not teach or disclose the claimed invention and thus cannot anticipate the claims of the present application. Thus, for the reasons given herein, the rejection of Claims 94-103 under 35 U.S.C. §102(b) is obviated; withdrawal thereof is respectfully requested.

Moreover, as shown by the teachings in Kroto, et al. and commented by Curl, et al. the process of Kroto, et al. only produced molecules of C_{60} and/or C_{70} in quantities insufficient to see those products with the naked eye. Moreover, as further indicated by Curl, et al. no matter how much they tried they would not isolate visible amounts of fullerenes, i.e., they would not produce fullerenes in amounts sufficient to be seen by the naked eye. Thus, Kroto, et al. do not teach

disclose or suggest fullerenes in amounts that are visible. They do not teach, disclose or suggest fullerenes in quantities sufficient to be obtained in a visible solid. Based on the above, they were unable to make fullerenes in larger amounts.

Moreover, applicants respectfully submit that the Kroto, et al. article is non-enabling to make fullerenes, e.g., C_{60} or C_{70} in amounts that are visible or language equivalent thereto, e.g., visible solid form, in an amount sufficient to isolate as a solid, in macroscopic amounts or in any equivalent language. They never prepared solid or crystalline C_{60} or C_{70}, as presently claimed. It was not possible to prepare the visible solid or, for that matter, C_{60} or C_{70}, in any appreciable amounts, without undue experimentation. As stated in Curl, et al., despite extensive efforts by the scientific community, no one was successful in preparing C_{60} or C_{70} in any appreciable amounts before the present invention. Consequently, Kroto, et al. do not teach, disclose, or even suggest solid fullerene in visible amounts macroscopic amounts of fullerenes, or visible amounts, of fullerenes, as presently claimed. In fact, Kroto, et al. are not enabling for producing any fullerenes in these quantities.

To be enabling, a reference must describe an invention sufficiently to have placed the public in possession of it. In re Donahue, 766 F.2d 531, 226, USPQ 619 (Fed. Cir. 1985).

The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosure in the reference coupled with the information known to one skilled in the art without undue experimentation. United States v. Teletronics, Inc., 857 F.2d 778, 775 8 USPQ 21 1217 (Fed. Cir. 1988), cert. denied 109 S.Ct. 1954 (1989).

But, the public was not possessed of a method of preparing, isolating, and C_{60} and C_{70}, in the amounts claimed in the present application, including a C_{60} or C_{70} in the solid state. Based on the teachings by Kroto, et al., people skilled in the art were unsuccessful in preparing

macroscopic quantities of C_{60} or C_{70}. Despite extensive efforts, no solid fullerenes or C_{60} or C_{70} could be made or isolated until these were prepared and isolated by the present inventors. Furthermore, despite the extensive efforts, no visible amounts of fullerenes was ever prepared and isolated until the advent of the present inventors. Thus, Kroto, et al. did not place the public in possession of the applicants' invention.

> It is well settled that prior art under 35 U.S.C. §102(b) most sufficiently describe the clamed invention to have placed the public in possession of it .... Such possession is effected if one of ordinary skill in the art could have combined the publication's description of the invention with his own knowledge to make the claimed invention. Accordingly, even if the claimed invention is disclosed in a printed publication, the disclosure will not suffice as prior art if it was not enabling...

In re Donahue, 766 F.2d 531, 533, 226 USPQ 619, 621 (Fed. Cir. 1985) Moreover, the Court continues that if the reference teaches that attempts to make the invention failed, as in the present case, the reference is non-enabling:

> ...In those cases, the references wee deemed insufficient because they stated that attempts to prepare the claimed compounds were unsuccessful. Such failures by those skilled in the art (having possession of the information disclosed by the publication) are strong evidence that he disclosure of the publication was non-enabling. Id.

Furthermore, Kroto, et al. were completely unsuccessful in making, isolating and collecting C_{60} and C_{70} in any appreciable amounts. They only had indirect evidence of what it is that they made. They never made fullerene as a visible solid. They admitted that they never made or isolated visible amounts of fullerenes. Thus, they never made macroscopic amounts of fullerenes. Whatever they made, they only made it in non-measurable amounts. At best, they

could only make molecules of something, only tens of thousands of molecules, which they could not touch, see or smell. No matter how much they tried, they were always unsuccessful in making more. They could never make enough material to put it in the possession of the public:

> Thus, for five years, we had been searching for a method of producing visible amounts of the stuff. We called our efforts "the search for the vial" because quantum calculations for such a soccer ball shaped carbon molecule suggested it would absorb light strongly only in the far violet of the spectrum....

Curl, et al. at 55.

Contrary to the allegations the Office Action, Kroto, et al. do not make the amounts of fullerenes, e.g., in the amounts recited in the rejected claims or place the public in possession thereof. Thus, Kroto, et al. is non-enabling for making the amounts claimed in the present process and cannot be used for that purpose.

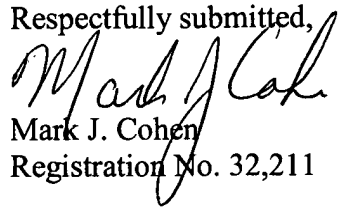
Thus, the process described in Kroto, et al. could not make fullerenes as a solid, in amounts that are visible as a solid and do not teach, disclose or suggest how to do so. Kroto, et al. only teach and suggest, at best, molecules of C_{60} or C_{70}, not enough to see. Finally, as indicated hereinabove one of ordinary skill in the art at the time of the filing of the applications could not make fullerenes in these amounts.

Thus, Kroto, et al. do not teach, disclose or suggest the subject matter of the rejected claims.

Therefore, the rejection of Claims 90-92 and 95-106 under 35 U.S.C. §102(b) or in the alternative under 35 U.S.C. §103(a) is obviated; withdrawal thereof is respectfully requested.

Thus, in view of the Amendment to the claims, and the remarks herein, it is respectfully submitted that the present case is in condition for allowance, which action is earnestly solicited.

Respectfully submitted,



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